3.17 Geology and Soils

The soils and geology characteristics of the Utah County and southern Salt Lake County valleys are presented from a regional perspective. The impacts that the project alternatives would have on these soils, and the constraints the geologic and soils characteristics may place on construction of Alternative 4 are described in this section.

3.17.1 Affected Environment

The majority of the project lies in Utah County, in northern Utah's urban corridor just south of Salt Lake Valley. Utah Valley lies at the center of Utah County, lined on the east by the Wasatch Mountains. Utah Lake, a natural fresh water lake, occupies a large part of the valley. All rivers in the valley flow into Utah Lake, which empties into the Jordan River to the north. The northernmost five miles of the project alignment is located in Salt Lake Valley, separated from Utah Valley by the Traverse Mountain Ridge. Salt Lake Valley in Salt Lake County is bound by the Wasatch Mountain Range to the east and by the Oquirrh Mountain Range to the west.

Utah Valley and Salt Lake Valley lie on the eastern edge of the Basin and Range physiographic province. The Basin and Range province, extending from western Utah to the west through most of Nevada, consists of linear valley basins divided by several north-south trending mountain ranges. The Utah and Salt Lake valleys consist of deep basins filled with quaternary deposits.

Much of Salt Lake and Utah valleys, including the portion of I-15 under study, consists of sediments deposited during the time of Lake Bonneville, or during its various phases of fluctuations. These materials (late Pleistocene or younger in age) consist of interbedded silt, silty clay and fine sand at lower elevations with coarse sand and gravel along former beach lines.

From Payson to Springville, surficial soils consist of predominantly Lake Bonneville deposits of the Provo Shoreline era. From Springville to Lehi, where I-15 flanks the eastern shore of Utah Lake, native soils consist of predominantly post-Bonneville stream deposits and very recent lake deposits. North of Lehi into southern Salt Lake County, native soils consist of predominantly Lake Bonneville deposits with age distinguished by features of the Provo Shoreline (14,000 to 13,000 years old) (Anderson et al 1986).

Seismicity and Faulting

Tectonic activity in the region has also shaped the existing topography. Utah and Salt Lake valleys lie within the Intermountain Seismic Belt (ISB), a delineated zone of numerous fault traces and historical earthquakes in the Intermountain West. The ISB is located near the eastern boundary of the Basin and Range province, and extends from northwestern Montana southward for approximately 800 miles to northern Arizona. Since 1850, at least 16 earthquakes of magnitude 6.0 or greater have occurred within the ISB; however, none of these events occurred on any faults in the Salt Lake or Utah valleys.

The Wasatch fault along the western base of the Wasatch Mountains is considered to be the primary seismic source. The Wasatch fault extends approximately 200 miles from Malad City, Idaho to Fayette, Utah, and is comprised of ten segments. Five of these –Nephi, Provo, Salt Lake City, Weber, and Brigham City – comprise the central segments of the Wasatch fault.

The southernmost portion of the I-15 corridor is located very close to the Nephi fault segment. In Payson, the northern tip of the Nephi fault segment crosses the I-15 alignment. Between Payson and the Traverse Mountains, which mark the boundary between the Salt Lake City and Provo fault segments, the remainder of the project alignment is located approximately 0.5 to 5 miles west of the Provo fault segment. At Point of the Mountain, the Wasatch fault veers sharply to the east and is located 5 to 8.5 miles away from I-15. The uppermost three miles of the project alignment, from Point of the Mountain (in the Traverse Mountains) to 12300 South, is located approximately 2.5 to 3.5 miles west of the Salt Lake City fault segment (Hecker, 1993).

The largest probable earthquake anticipated for Utah is a magnitude 7.0 to 7.5 earthquake on the Wasatch fault. The composite recurrence interval for earthquakes greater than magnitude 7 on the central segments of the Wasatch fault is 350 years. On any one segment, the average recurrence interval ranges from about 1200 to 2600 years. The last large earthquake occurred about 600 years ago on the Provo segment (Utah Geological Survey, 1996).

Liquefaction may occur when water-saturated sandy soils are subjected to earthquake ground shaking. When soil liquefies, it loses strength and behaves as a viscous liquid (like quicksand) rather than as a solid. This can cause buildings to sink into the ground or tilt, empty buried tanks to rise to the ground surface, slope failures, nearly level ground to shift laterally tens of feet (lateral spreading), surface subsidence, ground cracking, and sand blows.

Liquefaction has caused significant property damage in many earthquakes around the world, and is a major hazard associated with earthquakes in Utah. The 1934 Hansel Valley and 1962 Cache Valley earthquakes caused liquefaction, and large prehistoric lateral spreads exist at many locations along the Wasatch Front. The valleys of the Wasatch Front are especially vulnerable to liquefaction because of susceptible soils, shallow ground water, and relatively high probability of moderate to large earthquakes (Utah Geological Survey, 2007).

3.17.2 Alternative 1: No Build

Alternative 1 does not improve the ability of the existing I-15 freeway to withstand a seismic event. Surface fault rupture is expected for an earthquake on the Wasatch fault of magnitude 6.5 or greater. A surface fault rupture hazard is not generally a concern for Alternative 1 except where the Wasatch Fault crosses I-15 in Payson.

3.17.3 Alternative 4: I-15 Widening and Reconstruction

The impacts of Alternative 4 on geology and soils and the constraints that these elements have on the project require consideration of earthquake faults, liquefaction, and other geologic considerations. The Preferred Alternative includes Option C at American Fork Main Street and Option D in the Provo/Orem area. Since differences between options in the Provo/Orem area (Options A through D) or in the American Fork Main Street area (Options A, B, and C) are immaterial to geologic and soils impacts or constraints, these options are not discussed separately below.

Surface Fault Rupture

Surface fault rupture is expected for an earthquake on the Wasatch fault of magnitude 6.5 or greater. Surface fault rupture hazard is generally not a concern for the project, except where the Wasatch fault crosses I-15 in Payson.

Liquefaction

The subsurface conditions and seismicity in Utah indicate that liquefaction is a significant hazard in some areas of the state. I-15 traverses zones of liquefaction potential ranging from high to very low. High liquefaction potential suggests that there is a greater than 50% probability of having an earthquake of sufficient magnitude to induce liquefaction of submerged granular soil layers (the probability that the critical acceleration will be exceeded in 100 years). Moderate liquefaction potential suggests that there is a 10-50% chance that the site will experience ground shaking severe enough to cause liquefaction. Low suggests there is a 5 to 10% probability of exceedance, and very low suggests the probability of exceedance is less than 5%. For the project alignment, maps (Anderson et al 1986) identify the liquefaction potential as follows:

Section of Project Alignment	Mapped Liquefaction Potential
Payson to Provo	High (with a Moderate zone in south Payson)
Provo to Orem	Moderate (with a Low zone in north Orem)
Orem to Lehi	High
Lehi to 12300 South	Very Low to Moderate

Other Geologic Considerations

Review of the geologic map by Mulvey (1992) indicates that the project is not underlain by soil or rock that is expansive, collapsible, gypsiferous, or subject to piping. Surficial materials do not consist of limestone or karst (prone to sinkholes), peat (subject to excessive settlement when loaded), or sand dunes (subject to destabilization). Review of the map by Harty (1991) indicates that there have been several deep-seated landslides near the project alignment just south of Point of the Mountain. A deep-seated landslide and two lateral spreads have been mapped near the alignment in Spanish Fork.

3.17.4 Geology and Soils Mitigation

Geotechnical investigations in accordance with UDOT requirements will be conducted as part of the design phase. The design of subsurface, pavement, and structures will be based on the recommendations of the geotechnical engineering analyses. The structures will be designed to meet seismic standards and specifications.

3.18 Construction Impacts

Alternative 1 would have no construction impacts.

Construction of Alternative 4 would have impacts on the manmade environment and the natural environment in the I-15 study area. This section describes how construction could be phased along the 43-mile long corridor, the general construction methodology that would be used, maintenance of traffic, the construction impacts on resources, and mitigation measures to minimize those impacts. There are no identifiable differences in construction impacts among the design options in the Provo/Orem area (Options A, B, C, D) and American Fork Main Street Interchange (Options A, B, C).

As the construction of I-15 will be phased in accordance with availability of funds, the phasing presented in this section is based on the best information available at the time of this analysis. Changes in phasing and the sequencing of construction within any given phase may occur and will likely have different impacts on traffic from that presented in this discussion.

3.18.1 Construction Phasing

UDOT is currently evaluating a construction phasing plan. At this time, no specific construction phasing has been determined and is dependent upon funding availability. However, UDOT anticipates that:

- Preconstruction would proceed after this NEPA process is complete. Preconstruction includes design and right-of-way acquisition.
- Construction may occur in multiple phases, dependent upon funding availability.
- Construction is anticipated to begin in 2011-2012 and is expected to last approximately four to seven years.

3.18.2 Construction Methodology

Reconstruction of I-15 under Alternative 4 would include the construction of the I-15 mainline, reconstruction of interchanges, associated noise barriers, drainage elements, structures, and reconstruction of those portions of cross streets included in the project. It is anticipated that Design-Build will be the project delivery method, similar to the approach used for the reconstruction of I-15 from 10600 South to 600 North in Salt Lake County. The following presents a general overview of information and construction activities that would likely occur in each construction phase.

General Construction Information

It is anticipated that at least two lanes of I-15 traffic, in each direction, would remain open during construction from Bangerter Highway to Spanish Fork. Two lanes would likely remain open from Spanish Fork to South Payson. There would likely be occasional temporary closures of I-15 during critical construction activities. The public would be informed in advance of any closures. Construction is anticipated to occur both night and day and on weekends.

Construction Activities

The following is a list of construction activities that are anticipated for this project.

- Utility relocations. Generally, these would occur when right-of-way has been acquired. Where right-of-way is not required, relocation could occur earlier. Relocation of utilities is typically conducted by utility owner.
- Mobilization and general site preparation. This activity would include clearing and grubbing, removal and storage of topsoil, selective removal of trees and stumps, removal of obstructions, and excavation and removal of existing pavement where required.
- General grading and roadbed preparation. This phase would include most of the earthwork needed to develop a new roadbed and its associated cuts and fills.
- Bridge structures and other structures. These would be constructed in concert with roadwork.
- Storm water management systems construction. This would include construction of storm drain facilities and systems, laterals, cross drains, detention ponds, and other roadway drainage features need to channel and treat highway storm water runoff.
- Construction of temporary pavement sections. Temporary pavement would be placed on portions of the new graded roadbed to enable traffic to continue to use I-15 during construction.
- Construction of the permanent pavement sections. This would include placement and compaction of granular sub-base, base, pavement and surface course. The surface course would be the last paving operation.
- Signing, striping and lighting. Final signing, striping and lighting would occur once the permanent pavement sections are completed.
- Landscaping of the right-of-way. This would generally be one of the last construction activities, except where required for erosion control, weed control, or control of particulate matter.

3.18.3 Construction Impacts Mitigation

Mitigation commitments for environmental impacts from construction are documented in each resource's section. A maintenance of traffic (MOT) plan, emergency services plan, a proactive public information program and a media relations plan will be developed and implemented to keep travelers and businesses advised.

3.19 Cumulative Impacts

3.19.1 Introduction

Cumulative impacts are defined by the CEQ regulations in 40 Code of Federal Regulations (CFR) 1508.7. The CEQ regulations define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time." Cumulative impacts include the direct and indirect impacts of a project together with the reasonably foreseeable future actions of other projects.

3.19.2 Methodology for Determining Cumulative Impacts

The methodology for determining the cumulative impacts of the proposed I-15 project is based on *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997).

This chapter provides a general overview of the methodology used to conduct the cumulative impact analysis. The specific analyses of direct and indirect impacts are provided under the appropriate resource sections in this chapter.

3.19.3 Cumulative Impacts Analysis

3.19.3.1 Cumulative Impact Concerns Identified during Scoping

As part of the I-15 EIS process, scoping meetings were held with the public and resource agencies to help identify issues to be analyzed in the EIS. The comments received during the public and agency scoping period were reviewed to determine if any important issues were identified.

Public Concerns

The public identified primarily concerns about transportation, access, and congestion, based on the public involvement program discussed in Chapter 5 of this DEIS. Some concern was expressed about loss of farmland.

Concerns of Local Municipalities

Meetings were held with local municipalities in the I-15 study area. The main issues identified by community officials included transportation facilities, access, congestion, and specific design options for Alternative 4.

Concerns of Resource Agencies

Several methods were used to solicit potential issues from the resource agencies. First, during the I-15 scoping period, letters were sent to the agencies asking them to identify issues to be studied in the EIS. Second, a resource agency scoping meeting was held on June 5, 2003, to identify potential issues and develop initial methodologies for conducting the cumulative impacts analysis. Third, after the scoping meeting, ongoing coordination with the resource agencies continued to refine issues and EIS methodologies for analyzing cumulative impacts. Over the course of the scoping period, the resource agencies identified the following initial issues:

- Loss of wildlife habitat, including riparian habitat;
- Loss of wetlands; and
- Impacts to regional air and water quality.

3.19.3.2 Important Cumulative Impacts Issues

Based on the scoping process and the potential for direct impacts from the I-15 project, UDOT and FHWA identified the five resources that could be affected by cumulative impacts. Other resources are not expected to be affected by cumulative impacts the five potentially affected resources are

- Wetlands and wildlife habitat;
- Air quality;
- Water quality; and
- Farmland.

3.19.3.3 Urban Growth and Land Use

The potential cumulative impacts on the resources under study depend on future changes in land use in the study area and the direct impacts from the I-15 project. The cumulative impact analysis considered the anticipated changes in land use from regional growth and from direct and secondary (induced) growth caused by the I-15 project. The past and present changes in land use in the I-15 study area are one of the main factors causing the loss of wetlands, wildlife habitat, and farmlands and the degradation of water and air quality.

Timeframe for the Analysis

The timeframe for the cumulative impacts analysis includes two components: the period for which past, known impacts were analyzed and the period for which future predicted impacts were analyzed. The time period for past impact analysis varies by resource depending on the timeframe for which historical data were available. The time period for future impact analysis extends from the present day to the reasonably foreseeable year of 2030.

The time period for the past analysis was determined by the information available for each resource. For some resources, data were available for only the past 10 to 20 years, while for other resources data were available back to early European settlement of the Wasatch Front. In addition, for some resources such as air quality, it was more appropriate to begin the analysis when data were available from monitoring sites rather than at the onset of modern settlement when air quality records were not available. The specific past-year timeframe for each resource analysis is described in each specific resource chapter and is listed below:

- Farmland – 1900 to 2030;
- Air quality – 1975 to 2030;
- Water quality – 1970 to 2030; and
- Wetlands and wildlife habitat – 1850 to 2030.

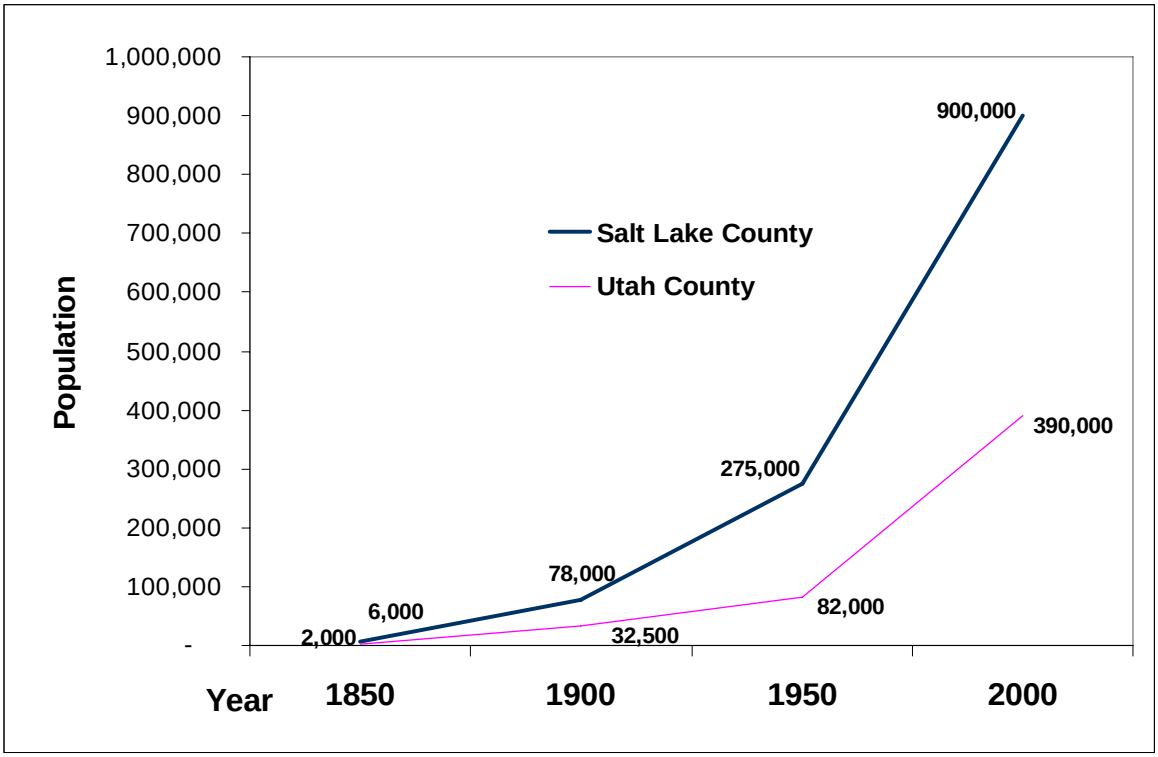
3.19.3.4 Other Actions Affecting the Resources, Ecosystems, and Human Communities of Concern

This section provides a brief overview of the past actions and present and reasonably foreseeable actions that contributed or could contribute to cumulative impacts. Many of the baseline conditions relevant to cumulative impacts are described in detail in each chapter in this EIS.

Past Actions

Utah and Salt Lake counties have experienced major urban expansion resulting in large residential, commercial, and industrial centers along with associated infrastructure such as freeways and surface streets. The 1850 U.S. census found that Salt Lake County had a population of about 6,200 people and Utah County had a population of about 2,000 people. As shown in Figure 3.19-1, the population has increased dramatically since 1850 and this steady increase has led to continuing urban expansion (Utah Governor's Office of Planning and Budget 2000).

Figure 3.19-1: Population Growth in Utah and Salt Lake Counties, 1850 to 2000



The population growth has led to about 30,000 acres being developed for urban uses out of the total 178,500 acres (both developable and undevelopable lands). Utah County has had about 77,000 acres developed out of 1,372,000 acres in the county. Salt Lake County has had about 172,000 acres developed for urban uses out of 489,000 acres in the county. Many of the undeveloped areas consist of undevelopable land such as the Wasatch Mountains and Utah Lake. The urban development has caused the loss of farmland, wetlands, and wildlife habitat. The urban growth has also degraded regional air and water quality. The amount of land available for growth in Utah and Salt Lake counties is limited by the surrounding mountains, the Great Salt Lake, and Utah Lake. Figure 3.19-2 Greater Wasatch Area Developed Land, 2006, provides an overview of developed areas along the Wasatch Front in 2006.

Most growth in Utah County has been suburban. Growth in this area started to occur in the 1980s. Many of the wetlands north of Utah Lake were eliminated with the introduction of farming in the 1900s and, starting in the 1980s, these farmlands along with additional wetlands were affected by urban development north of the lake.

Major past actions in Salt Lake County include the establishment of the Kennecott open-pit mine along the western edge of the Salt Lake Valley in the early 1900s. The establishment of the mine led to a major influx of population between 1900 and 1910, which established small residential areas in Magna and other locations along the western foothills. Though the population steadily grew in the western side of the Salt Lake Valley, it remained largely agricultural until the 1960s.

In the early 1970s, the western side of the Salt Lake Valley in the I-15 study area began to develop rapidly. Major transportation expansion in the I-15 study area occurred in the 1960s with the construction of Interstate 15 (I-15), Interstate 80 (I-80), and State Route (SR) 201. The western portion of Interstate 215 (I-215) was constructed in the 1980s and Bangerter Highway west of I-15 in the 1990s. These transportation projects served the main employment

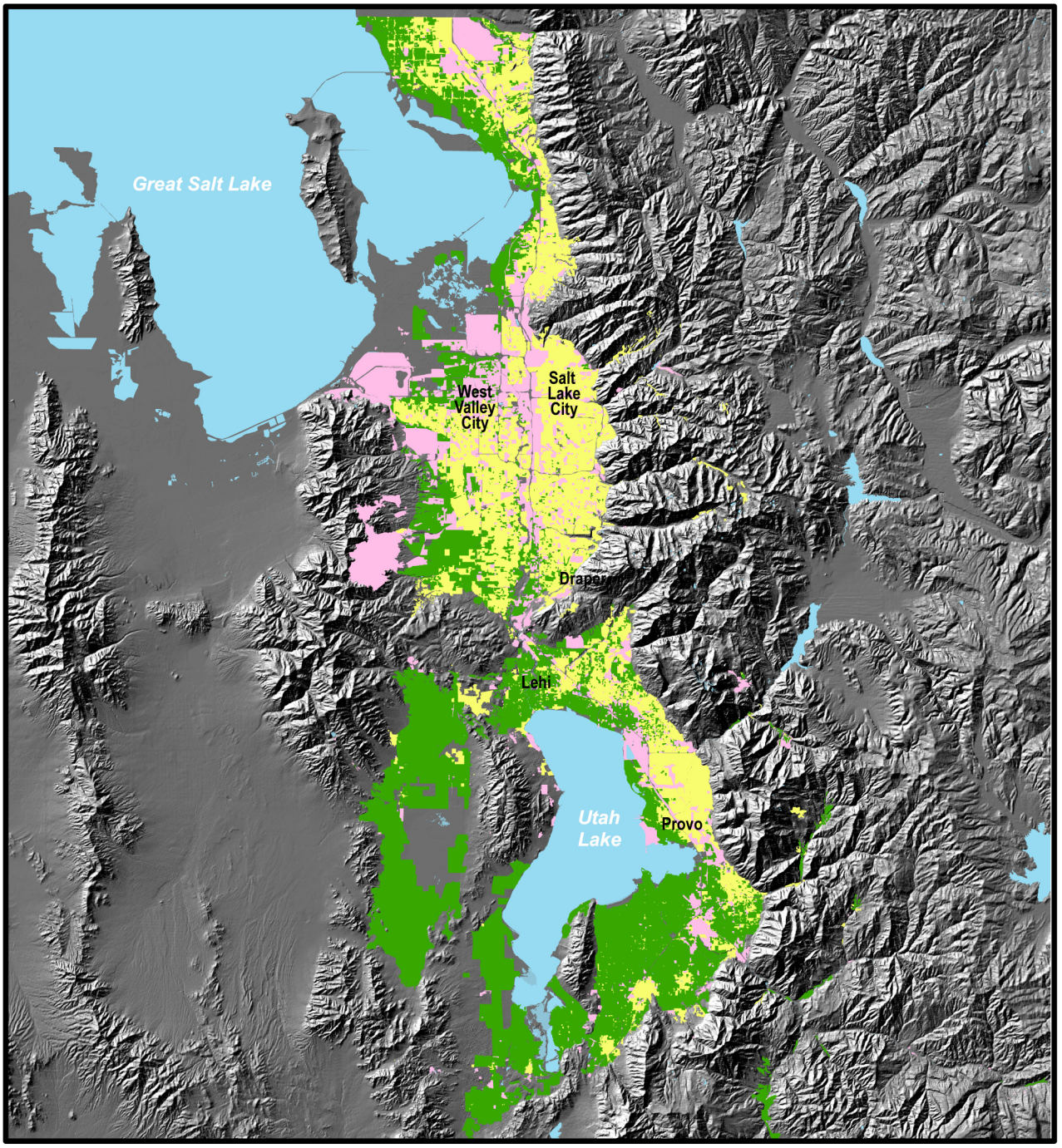
center of Salt Lake City and the supporting suburban areas that developed south, southeast, and north of the city center. The Salt Lake City International Airport was first developed in the 1930s with a major expansion between 1975 and 1980. Major rail freight lines were established in western Salt Lake Valley in the early 1900s to support mining operations.

Present and Reasonably Foreseeable Actions

Several steps were taken to determine potential present and future actions to consider in the cumulative analysis. The first step involved coordinating with the Utah Department of Transportation (UDOT), the Utah Transit Authority, the Wasatch Front Regional Council, and the Mountainland Association of Governments to help identify other transit and roadway projects that could result in cumulative impacts when combined with the I-15 project. This step included reviewing environmental documents that were recently completed or are in progress. In addition, UDOT held multiple meetings with project managers to identify current and upcoming projects and the scope of the potential impacts. The intent of these meetings was to address region-wide issues related to cumulative impacts.

Next, municipalities in the I-15 study area were contacted to help identify major local projects including private developments. Finally, Envision Utah information was gathered concerning potential long-term (2030) growth trends anticipated for the Wasatch Front including the anticipated number of acres of land that will be developed. Figure 3.19-3 shows the amount and type of developed land by 2030. Tables 3.19-1 and 3.19-2 show the major projects identified as other actions to be considered that could affect these resources in the I-15 study area. Figure 3.19-4 and Figure 3.19-5 show the location of transportation projects in both Utah and Salt Lake counties. Figure 3.19-6 shows the general locations of present and reasonably foreseeable development actions.

As noted in Table 3.19-2, about 40,000 additional acres are expected to be developed in the next 30 years in Utah and Salt Lake counties based on current urbanized acres of about 30,000 acres and about 70,000 acres in 2030 if current trends continue (Envision Utah 2003). This developed land includes the proposed future residential and commercial developments and the approximately 250 roadway and transit projects identified in the Wasatch Front Regional Council long-range transportation plan (WFRC 2003), as well as the approximately 120 projects in the Mountainland Association of Governments long-range transportation plan (MAG 2005). Many future development or infrastructure projects are not listed in Tables 3.19-1 and 3.19-2 because they are not yet included in adopted plans. However, these projects are included in the expected 40,000 acres of overall development. Because most of the projects in the long-range transportation plans are in the planning stages, specific impact information could not be obtained.



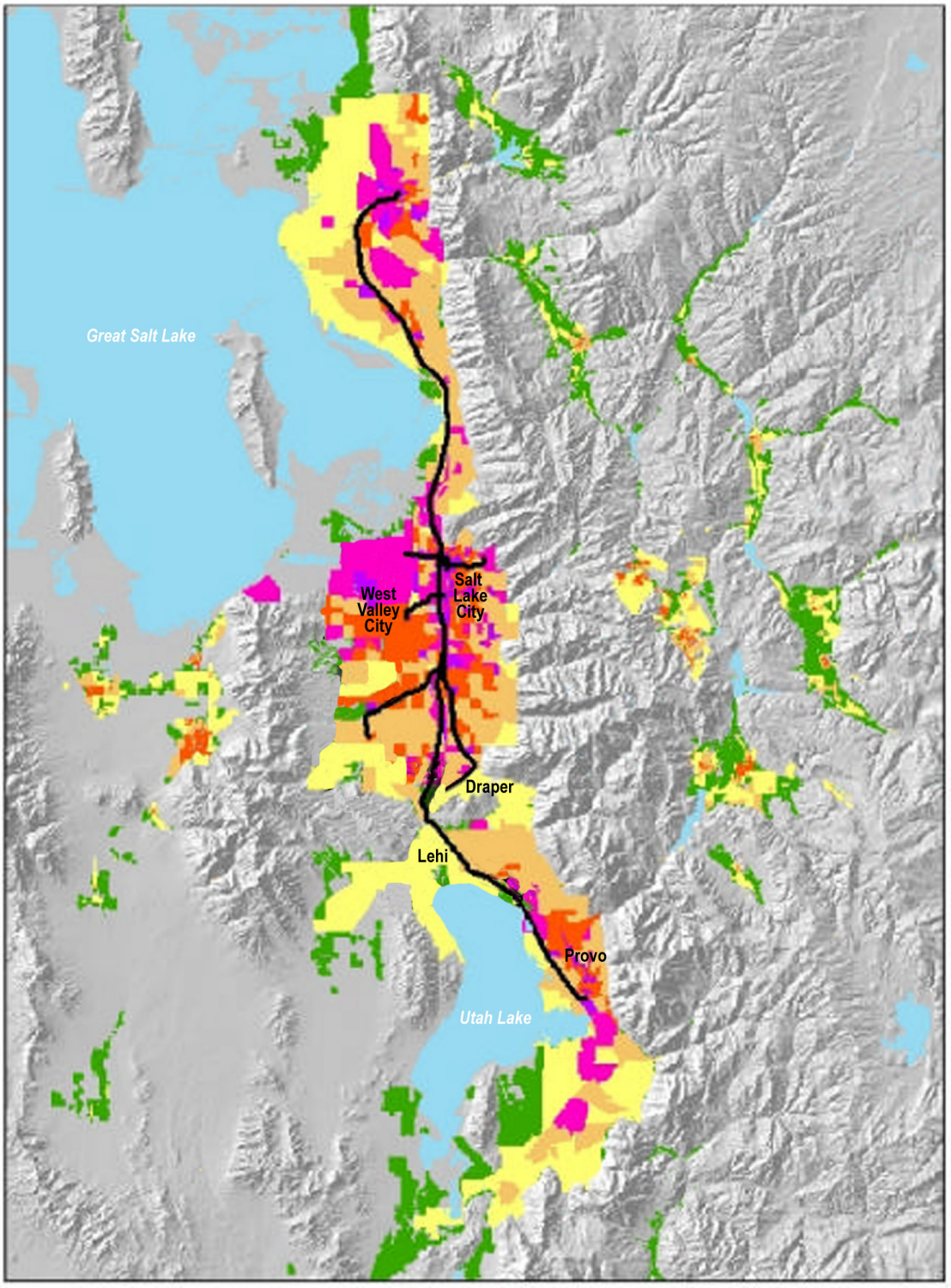
Scale in Miles
0 2.5 5 7.5 10

Figure 3.19-2
Greater Wasatch Front Developed Land 2006

LEGEND:
Water Bodies
Development Type
Residential
Commercial/Industrial
Agriculture

N

Source: Utah Division of Water Resources



Not to Scale

Figure 3.19-3

Greater Wasatch Front Developed Land 2030

LEGEND:

Development Type:

Residential
- Exurban
- Suburban
- Urban

Commercial
- Dispersed
- Concentrated

Agricultural

Planned Rail Transit

Water Bodies

N

Source: Governor's Office of Planning and Budget

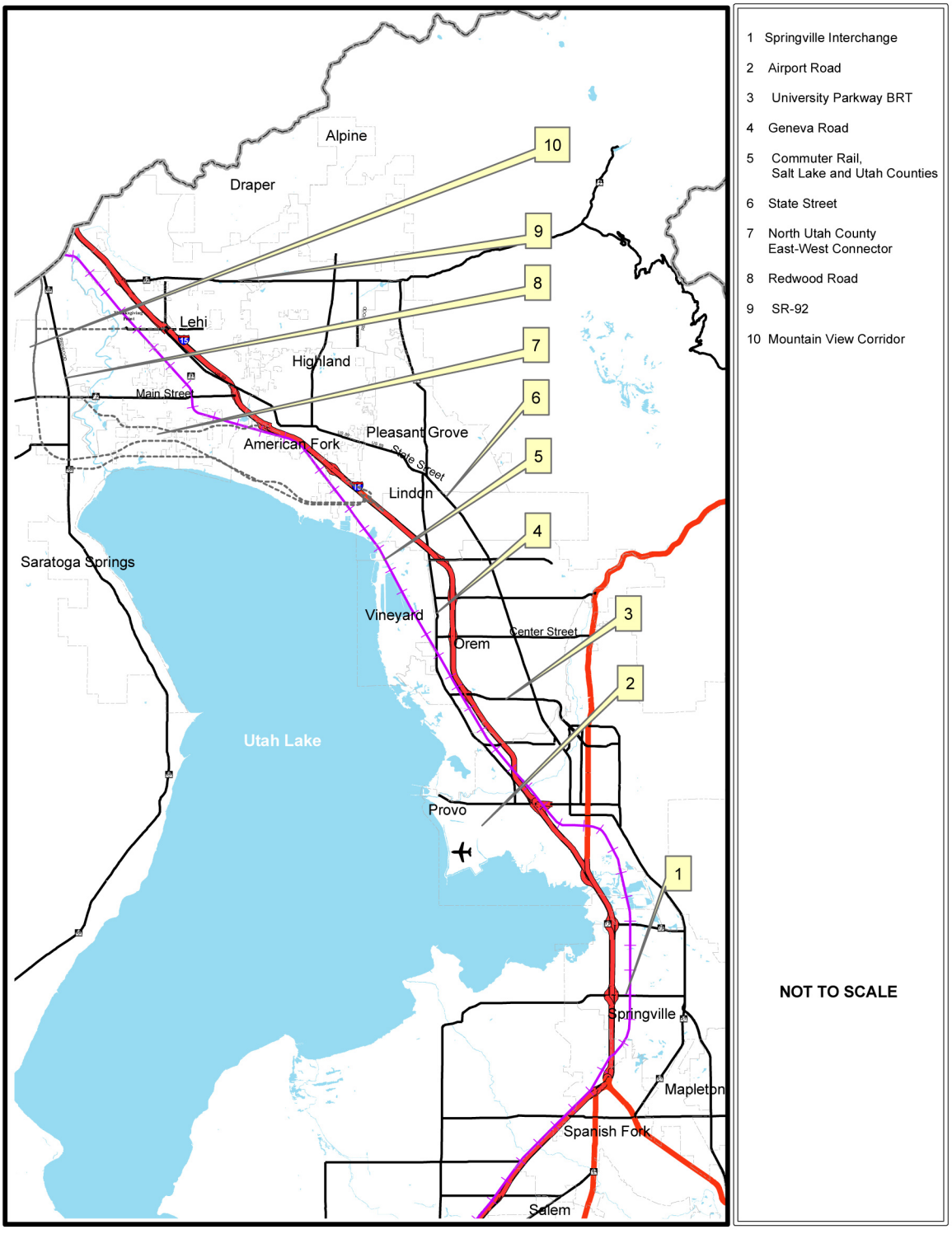


Figure 3.19-4

Present and Reasonably Foreseeable Transportation Actions - Utah County

LEGEND:

N

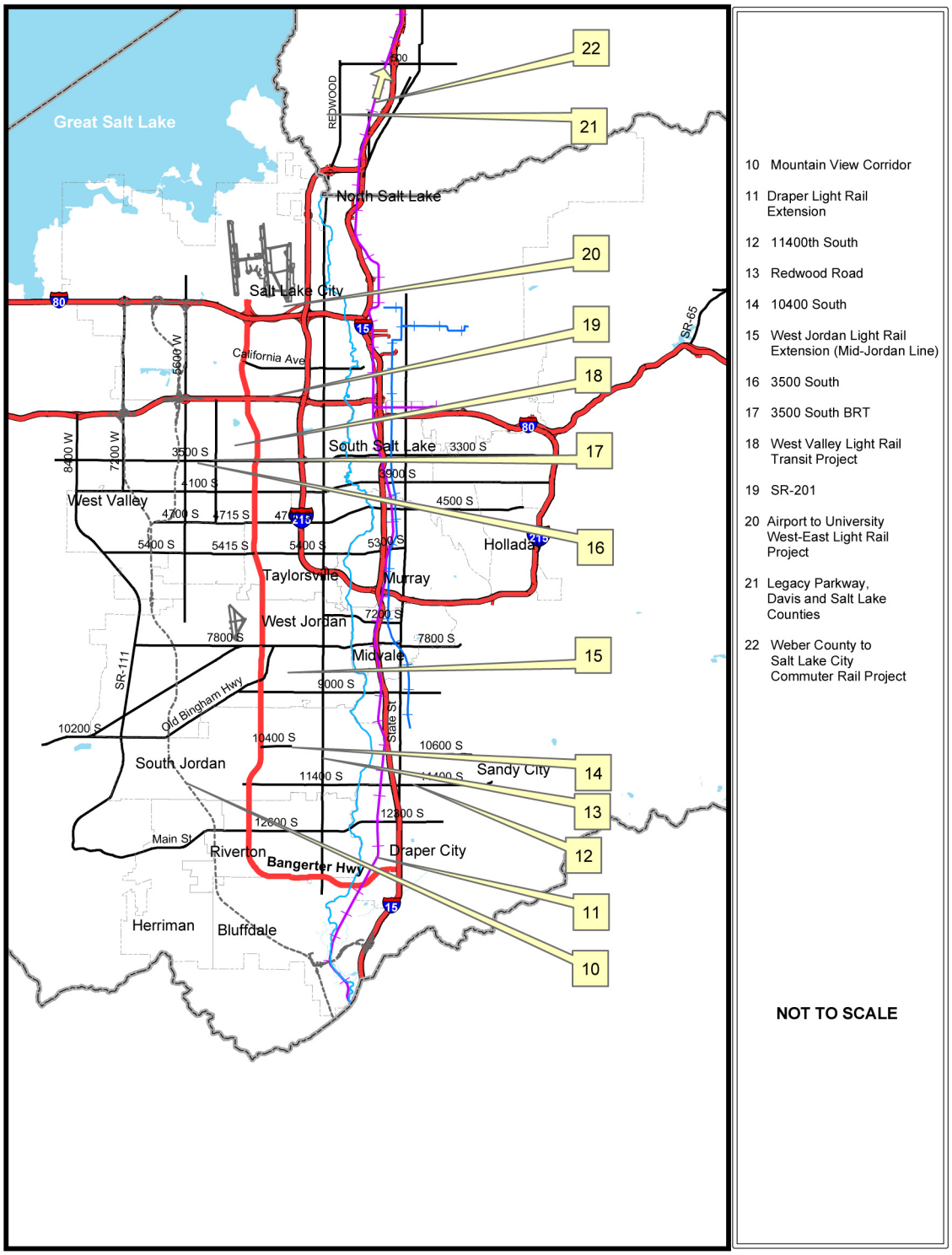


Figure 3.19-5

Present and Reasonably Foreseeable Transportation Actions - Salt Lake County

LEGEND:

N

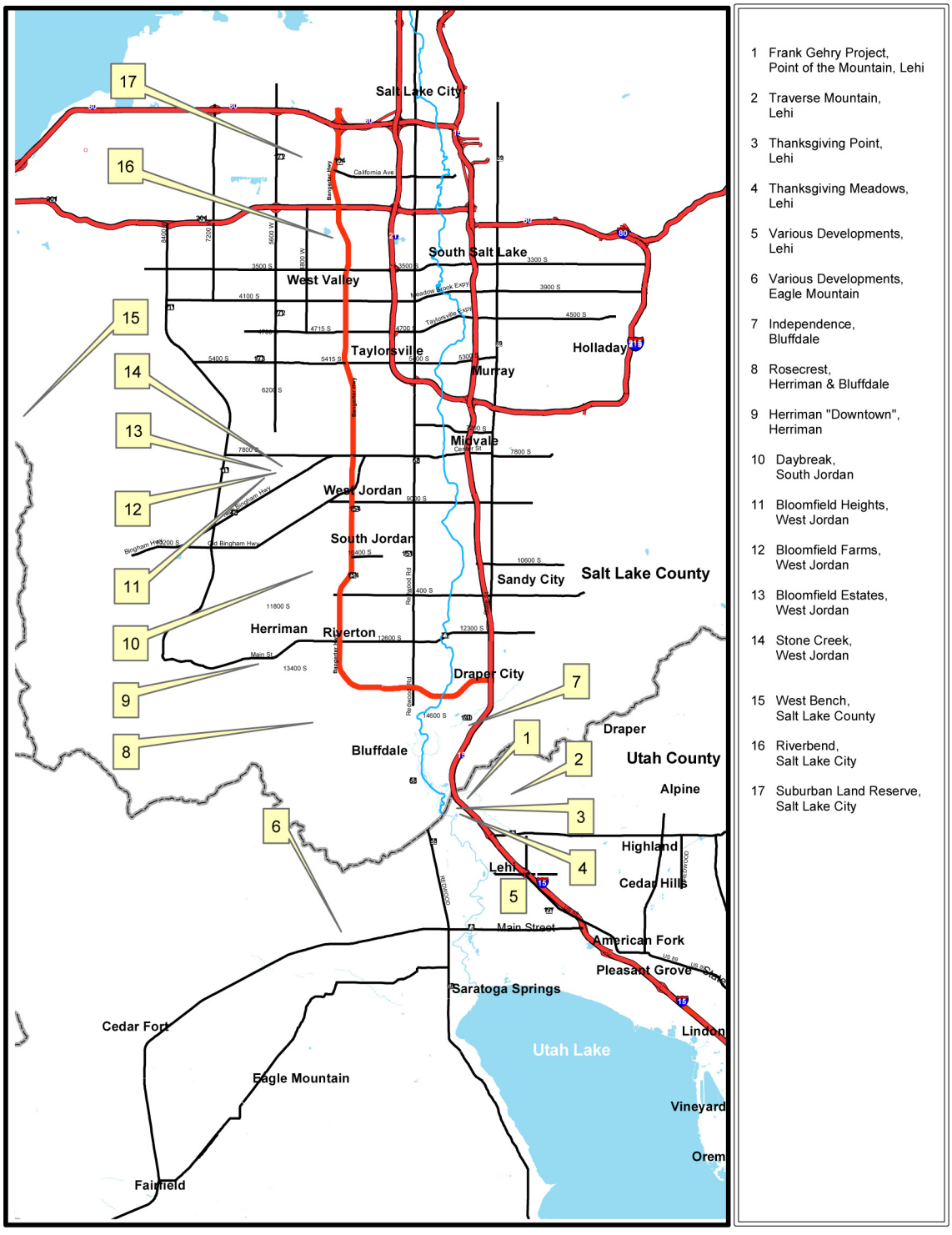


Figure 3.19-6

Present and Reasonably Foreseeable Development Actions

LEGEND:

N

Table 3.19-1: Present and Reasonably Foreseeable Transit and Roadway Actions

Project or Activity	Description	Impacts	Project Status
Utah County Projects			
1. Springville Interchange[b]	Improve interchange on SR 77.	Analysis in process; no data available	Planning
2. Airport Road[b]	Build new road from I-15 to Provo Airport or Center Street.	Analysis in process; no data available	Planning
3. University Parkway Bus Rapid Transit	New bus rapid transit on University Parkway.	None expected	Planning
4. Geneva Road[b]	Widen existing Geneva Road from 800 North in Orem to Center Street.	Analysis in process; the impacts below are estimates. ▪ Farmland – 0 to 20 acres ▪ Air Quality – Project conforms to State Implementation Plan ▪ Water Quality – Increase in impervious surface could reduce water quality ▪ Wetlands – 0 to 20 acres ▪ Wildlife Habitat – Some loss of habitat east of Utah Lake ▪ Threatened and Endangered Species – No impacts expected to June sucker, bald eagle, or Ute ladies'-tresses	Planning
5. Commuter Rail, Salt Lake and Utah Counties	Evaluation of commuter rail in Salt Lake and Utah Counties.	Analysis in process; no data available	Planning
6. State Street[b]	Improve intersections and widen State Street from 2000 North in Orem to 100 East in American Fork.	Analysis in process; no data available	Planning
7. North Utah County East-West Connector[b]	Build new road north of Utah Lake from Redwood Road to I-15.	Analysis in process; the impacts below are estimates. ▪ Farmland – 20 acres to 70 acres ▪ Air Quality – Project conforms to State Implementation Plan ▪ Water Quality – Increase in impervious surface could reduce water quality ▪ Wetlands – 10 acres to 40 acres ▪ Wildlife Habitat – Some loss of habitat ▪ Threatened and Endangered Species – None	Planning

Table 3.19-1: Present and Reasonably Foreseeable Transit and Roadway Actions - continued

Project or Activity	Description	Impacts	Project Status
Utah County Projects - continued			
8. Redwood Road (SR 68)[a, b] (UDOT 2007)	Widen Redwood Road from Bangerter Highway to the southern limits of Saratoga Springs.	▪ Farmland – 20.5 acres ▪ Air Quality – Project conforms to State Implementation Plan ▪ Water Quality – None ▪ Wetlands – 0.03 acre ▪ Wildlife Habitat – None ▪ Threatened and Endangered Species – None	Planning
9. SR 92[b]	Widen existing road from I-15 to SR 146.	Analysis in process; the impacts below are estimates. ▪ Farmland – None ▪ Air Quality – Project conforms to State Implementation Plan ▪ Water Quality – Increase in impervious surface could reduce water quality ▪ Wetlands – 0 to 1 acre ▪ Wildlife Habitat – Loss of 1 acre to 2 acres of habitat ▪ Threatened and Endangered Species – None	Planning
10. Vineyard Connector	Proposed new roadway from Orem to American Fork Main Street	Minor environmental impacts expected	Planning
11. Mountain View Corridor, Utah and Salt Lake Counties	New freeway from I-80 in Salt Lake County to Lehi in Utah County	*Impacts below are only for Utah County:* ▪ Prime farmland – 184 to 210 acres ▪ Agriculture Protection Areas – 0 to 6 ▪ Relocations – 32 to 127 ▪ Potential Relocations – 0 to 9 ▪ Recreation areas 2 to 3 ▪ Community Facilities – 0 to 1 ▪ Existing Trails –1 to 4 ▪ Proposed Trails – 6 to 20 ▪ Noise receptors above criteria – 134 to 226 ▪ Stream/canal crossings – 1 to 4 ▪ Wetlands – 14.74 to 78.32 acres ▪ Threatened and Endangered Species habitat – 0 to 1 ▪ Cultural Resources (adverse impacts) – 2 to 7 ▪ Hazardous Waste Sites – 2 to 6	EIS, Fall 2007

Table 3.19-1: Present and Reasonably Foreseeable Transit and Roadway Actions - continued

Project or Activity	Description	Impacts	Project Status
Salt Lake County Projects			
12. Draper Light-Rail Extension	Extension of existing north-south light rail to Draper.	Analysis in process; no data available	Planning
13. 11400 South[a, b] (FHWA 2005a)	Improve transportation system around 11400 South from Bangerter Highway to 700 East.	▪ Farmland – None ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – No impairment of the Jordan River or its tributaries ▪ Wetlands – 0.57 acres ▪ Wildlife Habitat – Between 0.33 acres and 3.54 acres of wildlife habitat affected, some near the Jordan River ▪ Threatened and Endangered Species – Minor changes to habitat for the common yellowthroat	Planning
14. Redwood Road[a, b] (UDOT 2005)	Widen Redwood Road from two to five lanes from 10400 South to Bangerter Highway.	▪ Farmland – None ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – No impairment of the Jordan River or its tributaries ▪ Wetlands – None ▪ Wildlife Habitat – Minor changes ▪ Threatened and Endangered Species – None	Construction
15. 10400 South[a, b] (FHWA 2003)	Widen 10400 South from Bangerter Highway to Redwood Road.	▪ Farmland – None ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – Improvements from implementation of storm drainage system ▪ Wetlands – None ▪ Wildlife Habitat – None ▪ Threatened and Endangered Species – None	Planning

Table 3.19-1: Present and Reasonably Foreseeable Transit and Roadway Actions - continued

Project or Activity	Description	Impacts	Project Status
Salt Lake County Projects - continued			
16. West Jordan Light-Rail Extension (Mid-Jordan Line), Salt Lake County[a] (Utah Transit Authority 2005b)	New light-rail line from the 6400 West light-rail station to South Jordan.	▪ Farmland – None ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – No increase in overall pollutant levels ▪ Wetlands – 0.32 acres ▪ Wildlife Habitat – 173 acres of previously disturbed habitat ▪ Threatened and Endangered Species – None	Planning
17. 3500 South, Salt Lake County[a, b] (UDOT 2006)	Widen 3500 South from Redwood Road to Bangerter Highway.	▪ Farmland – None ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – No increase in overall pollutant levels ▪ Wetlands – None ▪ Wildlife Habitat – None ▪ Threatened and Endangered Species – None	Planning
18. 3500 South Bus Rapid Transit	New bus rapid transit on 3500 South.	None expected	Planning
19. West Valley Light-Rail Transit Project, Salt Lake County[a] (Utah Transit Authority 2007)	New light-rail line from the 2100 South light-rail station to the West Valley City Center.	▪ Farmland – None ▪ Air Quality – None ▪ Water Quality – No increase in overall pollutant levels ▪ Wetlands – 0.72 acre ▪ Wildlife Habitat – 15.28 acres ▪ Threatened and Endangered Species – None	Planning
20. SR 201[a, b] (UDOT 2003)	Widening of and safety improvements on SR 201 from the Jordan River to 5600 West.	▪ Farmland – None ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – Improvements to water quality from stormwater system ▪ Wetlands – 3.7 acres ▪ Wildlife Habitat – Minor changes ▪ Threatened and Endangered Species – None	Under construction

Table 3.19-1: Present and Reasonably Foreseeable Transit and Roadway Actions - continued

Project or Activity	Description	Impacts	Project Status
Salt Lake County Projects - continued			
21. Airport to University West-East Light Rail Project, Salt Lake County[a] (Utah Transit Authority 1999)	Light rail from Salt Lake City to the Salt Lake City International Airport.	▪ Farmland – None ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – No increase in overall pollutant levels ▪ Wetlands – 4.89 acres ▪ Wildlife Habitat – No substantial changes ▪ Threatened and Endangered Species – None	Planning
22. Legacy Parkway, Davis and Salt Lake Counties[a] (FHWA 2005b)	Fourteen-mile, four-lane highway in Salt Lake and Davis Counties from I-15/US 89 to I-215.	▪ Farmland – 29 acres ▪ Air Quality –Conforms to State Implementation Plan ▪ Water Quality – No increase in overall pollutant levels ▪ Wetlands – 113 acres ▪ Wildlife Habitat – 700 acres ▪ Threatened and Endangered Species – Potential noise disturbance to bald eagle from construction	Construction
23. Weber County to Salt Lake City Commuter Rail Project[a, b] (Utah Transit Authority 2005a)	Commuter rail on existing tracks from Pleasant View in Weber County to Salt Lake City in Salt Lake County. New station locations.	▪ Farmland – 6.41 acres of direct impacts; 39.2 acres of indirect impacts ▪ Air Quality – Conforms to State Implementation Plan ▪ Water Quality – No increase in overall pollutant levels ▪ Wetlands – 19.3 acres ▪ Wildlife Habitat – No substantial changes ▪ Threatened and Endangered Species – None	Construction

[a] Data from most recent environmental document; see reference.

[b] Included in UDOT 2007 Statewide Transportation Improvement Program.

Table 3.19-2: Present and Reasonably Foreseeable Development Actions

Project or Activity	Description	Impacts	Project Status
Utah County	The area is developing quickly with traditional urban land uses (housing, commercial, retail, infrastructure, and institutional uses) through the 2030 planning period. The urbanized area is expected to increase from 30,500 acres in 2000 to about 70,000 acres in 2030. Development includes land developed as part of future roadway and transit projects identified in the long-range transportation plans. Large developments are listed below.	Loss of open space, farmland, wildlife habitat, and wetlands. Increase in air emissions, stormwater runoff, and noise.	Current and future land development projects are expected to the year 2030. Some projects are currently being developed, and others are in the preliminary planning stages. Some of the 70,000 acres of development include anticipated urban growth based on population projections.
Frank Gehry Point of the Mountain, Lehi (2,500 housing units)			
Traverse Mountain, Lehi (8,000 housing units)			
Thanksgiving Point, Lehi (328 housing units)			
Thanksgiving Meadows, Lehi (327housing units)			
Various Developments, Lehi (1,270 housing units)			
Various Developments, Eagle Mountain(25,390 housing units)			
Salt Lake County			
Independence, Bluffdale (3,600 housing units)			
Rosecrest, Herriman and Bluffdale (5,500 housing units)			
Herriman Downtown, Herriman (350-acre site, number of housing units not identified)			
Daybreak, South Jordan (20,785 housing units)			
Bloomfield Heights, West Jordan (106 units)			
Bloomfield Farms, West Jordan (80 units)			
Bloomfield Estates, West Jordan (160 housing units)			
Stone Creek, West Jordan (965 housing units)			
West Bench, Salt Lake County (200,000 housing units)			
Riverbend, Salt Lake City (2,000 housing units)			
Suburban Land Reserve, Salt Lake City (Number of units not identified; in planning process)			

In 2003, the Utah Governor's Office of Planning and Budget outlined projected growth that is expected along the greater Wasatch Front. As shown in Figure 3.19-3, Greater Wasatch Area Developed Land, 2030, much of the area that was undeveloped or agricultural in 2006, as represented in Figure 3.19-2, is expected to develop by 2030 based on current population growth rates. Most of the agricultural land in the I-15 study area is expected to be converted to urban development. Note that the Office of Planning and Budget uses different land-use classifications than those shown in Figure 3.19-2, which was prepared by the Utah Division of Water Rights.

3.19.4 Cumulative Impacts Analysis by Resource

Cumulative impacts were analyzed in accordance with CEQ guidance (CEQ 1997). This chapter provides the foundation for determining the important issues to be evaluated as well as the past, present, and reasonably foreseeable projects to be considered in the analysis. Detailed information about the affected environment and direct impacts from the I-15 is provided in the following sections of this chapter:

- Section 3.5, Farmlands
- Section 3.8, Air Quality
- Section 3.12, Water Resources
- Section 3.14, Wetlands/Waters of the U.S.
- Section 3.15, Wildlife, Threatened and Endangered Species
- Section 3.16, Cultural Resources

The following sections discuss the cumulative impacts that may affect certain resources in the I-15 project corridor study area.

3.19.4.1 Farmlands

The potential cumulative impacts on the resources under study depend on future changes in land use. For the farmland cumulative impact analysis, the geographic scope is Utah and Salt Lake counties. This area was selected based on the availability of data and because it is the likely area of development surrounding the I-15 project. The total timeframe of the farmland cumulative impact analysis is about 1900 through 2030. The baseline for the farmland cumulative analysis is 2002, the year for which the most recent data were available from the Utah Division of Water Resources' Land Survey.

Past Trends

Although data on the amount of farmland available in the period between 1900 and the 1960s were not available for Salt Lake and Utah Counties, vast areas of each county were farmed to supply the local population. In 1960, although the eastern areas of the two counties had been developed, the western valleys remained largely agricultural. In 1960, the Lower Jordan River Basin (which includes all of Salt Lake County) had about 93,000 acres of agricultural land. Between 1960 and 1994, the amount of agricultural land in this area declined to 43,800 acres. By 2002, the Utah Division of Water Resources' Land Survey noted only about 28,099 acres of agricultural land.

In 1966, in the Upper Jordan River Study Area (which includes Utah County and portions of the surrounding counties), there were about 172,700 acres of irrigated cropland. By 1995, the amount of irrigated cropland increased to 174,300 acres. However, the Utah Division of Water Resources' Land Survey did cite a decline in the total amount of land available for agriculture in Utah County from 211,259 acres in 1995 to 168,376 acres in 2002.

Future Trends

No data are available on the exact amount of agricultural land that will be converted to urban uses in the two counties. However, a comparison between Figure 3.19-2 Greater Wasatch Area Developed Land 2006, and Figure 3.19-3 Greater Wasatch Area Developed Land 2030, regional development would likely result in a greater-than-50%

loss of agricultural land. If loss of agricultural land in Utah and Salt Lake Counties is greater than 50%, there could be an overall reduction in agricultural land of about 100,000 acres.

I-15 Project Impacts

Alternative 4 would result in a direct loss of about 79 acres or less of agricultural land. Other planned transportation projects listed in Table 3.19-1 would result in about 2100 acres of additional impacts to agricultural land. These projects would potentially increase impervious surface area, and could impact wildlife that use farmland as habitat. However, the main contributor will continue to be urban growth that will occur between 2002 and 2030 in the two counties. This growth and development will occur with or without the I-15 project. No data are available on the exact amount of agricultural land that will be converted to urban uses in the two counties but it is expected that there will be a greater-than-50% loss of agricultural land, or about 100,000 acres. Overall, due to the planned conversion of existing agricultural land to residential or commercial uses in the next 30 years, the cumulative impact on agricultural land is expected to be near a 50% loss of agricultural land. Overall, the I-15 project would contribute to less than 0.0001% of the total loss in farmland.

Mitigation

Section 3.5, Farmlands, provides a detailed discussion of farmland mitigation measures. The mitigation measures include the following:

Owners of farmland and farm-related businesses within the I-15 right-of-way will be compensated according to the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, and other state and federal guidelines if the owners' properties are affected by project construction.

3.19.4.2 Air Quality

For the air quality cumulative impact analysis, the geographic scope is Utah and Salt Lake counties. This area was selected based on the availability of data and because it would be directly affected by the I-15 project. The total timeframe for the air quality cumulative impact analysis is about 1990 through 2030. The baseline for the air quality cumulative analysis is 2005, using data from the Utah Division of Air Quality's Annual Report for 2005 (Utah Division of Air Quality 2006).

Past Trends

Overall air quality in Utah and Salt Lake counties has been improving. In the past 25 years, Utah has made enormous progress in improving air quality. In the early 1980s, the health standards for four of the six criteria pollutants (carbon monoxide [CO], ozone, particulate matter, and sulfur dioxide, but not lead or nitrogen dioxide) identified by EPA were violated in one or more Utah counties. Currently, two of the six criteria pollutants identified by EPA, ozone and particulate matter (PM_{10}), occasionally reach levels that can affect the health and well-being of Utah's urban residents who are more sensitive to pollution, such as children, the elderly, and those with chronic health problems. These pollutants can aggravate respiratory disorders during periods of high pollution and lead to chronic illness (Utah Division of Air Quality 2006).

Historically, Utah had problems meeting the National Ambient Air Quality Standard for CO; however, it has been many years since violations occurred. In March 2004, a request was submitted to EPA to redesignate Provo as an attainment area for CO along with the associated maintenance plan. This request was approved in December 2005 and became effective on January 3, 2006. The plan demonstrated that there was no longer a need for oxygenated fuels and revised the transportation conformity budget to be consistent with EPA's latest mobile emissions model, MOBILE6. All areas with historic CO problems are now designated as maintenance areas for CO. The charts below show the historic air quality trends for five of the six criteria pollutants along the Wasatch Front (Utah Division of Air Quality 2006).